

CLAIMS

What is claimed is:

1. A tooling assembly for hot stretch-forming of a heat-softened sheet metal workpiece, said tooling assembly being adapted for attachment to a plate, said tooling assembly comprising:

a forming tool including:

a layer of predetermined thickness, said layer having a forwardly disposed forming surface thereon against which said workpiece is formed; and

a plurality of structures extending rearwardly from said layer and terminating in a rearward surface of said forming tool, said plurality of structures being adapted to support said layer, said plurality of structures defining at least one open cell therebetween to reduce thermal losses emanating away from said forming surface due to at least one of thermal conduction and thermal radiation;

a plurality of heating elements embedded within said layer for integrally heating said forming surface to enable hot stretch-forming of said workpiece;

thermal insulation disposed within said at least one open cell of said forming tool to reduce thermal losses emanating away from said forming surface due to at least one of thermal radiation and thermal convection; and

a plurality of insulative support posts disposed between said forming tool and said plate to establish a gap therebetween, said insulative support posts having greater resistance to thermal conductivity than said forming tool.

2. The tooling assembly as recited in claim 1, further comprising:

said plurality of structures including a plurality of exterior walls and a plurality of interior walls defining a plurality of open cells therebetween, said plurality of interior walls intersecting to define a plurality of intersections; and

said plurality of heating elements also being embedded within said plurality of structures to provide uniform heating of said forming tool to avoid warpage thereof.

3. The tooling assembly as recited in claim 1, further comprising:

said rearward surface having a plurality of blind passages provided therein, said plurality of load-bearing support posts being disposed within said plurality of blind passages and having rearward surfaces for mounting against said plate.

4. The tooling assembly as recited in claim 3, wherein said plurality of blind passages are formed at said plurality of intersections.

5. The tooling assembly as recited in claim 4, wherein said rearward surface is spaced a predetermined distance from said plate to define a gap therebetween, further wherein said thermal insulation is disposed between said rearward surface of said forming tool and said plate.

6. The tooling assembly as recited in claim 5, further comprising at least one cover strip peripherally attached to said plurality of exterior walls of said forming tool so as to contain said insulation and cover said gap.

7. A forming tool apparatus for hot stretch-forming of a heat-softened sheet metal workpiece, said forming tool apparatus comprising:

a forming tool including:

a layer of predetermined thickness, said layer having a forwardly disposed forming surface thereon against which said workpiece is formed; and

a plurality of support structures extending rearwardly from said layer and terminating in a rearward surface of said forming tool, said plurality of support structures being adapted for supporting said layer and defining at least one open cell between said plurality of support structures to reduce thermal losses emanating away from said forming surface due to at least one of thermal conduction and thermal radiation;

a plurality of heating elements embedded within said layer for integrally heating said forming surface to enable hot stretch-forming of said workpiece; and

thermal insulation disposed within said at least one open cell of said forming tool to reduce thermal losses emanating away from said forming surface due to at least one of thermal radiation and thermal convection.

8. The forming tool apparatus as recited in claim 7, wherein said plurality of structures includes a plurality of exterior walls, and a plurality of interior walls defining a plurality of intersections, said plurality of structures defining a plurality of open cells.

9. The forming tool apparatus as recited in claim 8, wherein said heating elements are also embedded within said plurality of structures of said forming tool to provide uniform heating of said forming tool to avoid warpage thereof, and further wherein said thermal insulation is disposed within said plurality of open cells of said forming tool to reduce thermal

losses emanating away from said forming surface due to at least one of thermal radiation and thermal convection.

10. An apparatus for hot stretch-forming of a heat-softened sheet metal workpiece, said apparatus being adapted for attachment to a plate, said apparatus comprising:

a forming tool including a forwardly disposed forming surface thereon and a rearward surface disposed substantially opposite of said forming surface, said rearward surface having a plurality of blind passages therein;

a plurality of heating elements embedded within said forming tool for integrally heating said forming surface for hot stretch-forming said workpiece; and

a plurality of load-bearing support posts disposed within said plurality of blind passages of said forming tool, said plurality of load-bearing support posts having a plurality of rearwardly disposed surfaces located against said plate, wherein said load-bearing support posts are composed of a thermally resistant material having greater resistance to thermal conductivity than said forming tool.